

Evaluation of pre-harvest desiccation strategies in clover seed production

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Background

- Desiccation with diquat about one week before seed harvest has up to now been the common practice in Norwegian clover seed production. However, after withdrawal of diquat in 2020, clover seed growers no longer have any desiccators available to dry down their crops before harvest.
- Several potential desiccants and herbicides are available on the international market. However, none of these products have been tested for use in clover seed production.
- Swathing is another alternative to dry the clover crop before seed harvest. However, due to a low swathing height (usually less than 10 cm), the windrows are left in close contact with the soil. This usually delays drying, especially if the windrows are thick and compact. While the method is widely used in other European countries, many Norwegian seed growers consider swathing to be an uncertain method because of unstable weather conditions during seed harvest. A focus on more open and less compact windrows could nevertheless be useful to reduce the time needed from swathing to seed harvest

Objective:

- The objective of this study was to find alternative desiccators to diquat in white and red clover seed crops. In red clover, an additional aim was to examine if an improved swathing technique could be an alternative strategy to dry down the crop before seed harvest.
- Our hypothesis was that swathing and/or desiccation with one or several of the tested chemicals would be an adequate substitution for diquat in clover seed production.

Materials and methods

- In 2019 and 2020, six field trials in red clover and two field trials in white clover was carried out to evaluate various alternative chemical products at different rates and at two different spraying dates, either early at 50% mature heads and / or late at 65% mature heads, i.e. about 14 and / or 7 days before seed harvesting.
- In addition, swathing was examined as an alternative to desiccation in two red clover trials in 2020.
- Products included in the study, either for one or two years, was Spotlight Plus (carfentrazone-ethyl), Beloukha (pelargonic acid), Glypper (glyphosate), Gozai (Pyraflufen-ethyl), Harmonix LeafActive (acetic acid), Harmonix FoliaPlus (pelargonic acid), Flurostar (fluroxypyr) and Saltex (sodium chloride) and liquid fertilizers (e.g. urea). More details about products and spraying dates/rates in the 2020-trials are shown in Table 1.



Photo 1. Swathing red clover seed crops. Photo Ingvild Evju.

Results and discussion

Swathing was the most efficient method to dry red clover seed crops before harvest (Table 1).

Despite none of the tested chemical products considered being superior to diquat, the most promising overall alternative desiccants was the two Harmonix-products, either FoliaPlus (T3) and LeafActive (T2) in red clover or FoliaPlus in white clover, that after an early and late spraying visually wilted the plants most in the experiments in 2020 (photo 2).

Although normally less effective than the two Harmonix-products, also Beloukha alone, especially when sprayed in

two rounds (early and late, T5), showed an acceptable desiccation effect.

Another promising strategy was the combination of an early spraying with Glypper (glyphosate) followed by Beloukha a week later (T10). However, as the glyphosate spraying affected germination negatively in some of the trials, the method seems too uncertain to recommend.

None of the other products (Gozai, Spotlight Plus, urea, Flurostar, vinegar or Saltex) desiccated the plants sufficient to be consider for use in clover seed production.



Photo 2. Aerial photo of a white clover trial (Gvarv, South Norway), on 12 August 2020 (two days before seed harvest). Numbers refer to the treatments in Table 1. Photo: Knut H. Solhaug

Table 1. Effect of various desiccation treatments on seed crop colour shortly before seed harvest and water content (%) in uncleaned seed just after seed harvest both in red clover and white clover trials in 2020 (mean of two trials in both species).

	Product application rate (L ha ⁻¹)		Red clover		White clover	
	10-14 days before seed harvest	5-7 days before seed harvest	Seed crop colour (1-9 is most brown / wilted) at harvest	Water content (%) in uncleaned seed	Seed crop colour (1-9 is most brown/ wilted) at harvest	Water content (%) in uncleaned seed
1. Spotlight Plus (60 g L ⁻¹ carfentrazone-ethyl)	1	0	3.5	17.5	3.6	33.0
2. Harmonix Leaf Active (240 g/L acetic acid)	250	250	8.2	14	4.6	24.7
3. Harmonix FoliaPlus (250 g L ⁻¹ pelargonic acid)	120	120	8.7	12	6.1	15.0
4. Beloukha (680 g L ⁻¹ pelargonic acid)	0	16	5.8	16	2.7	34.5
5. Beloukha (680 g L ⁻¹ pelargonic acid)	16	16	6.5	15	3.8	30.7
6. Vinegar (8,75% acetic acid)	500	500	5.6	14.5	3.3	35.7
7. Vinegar (8,75% acetic acid)	0	500	4.3	16	2.8	46.0
8. Glypper (360 g L ⁻¹ glyphosate)	2	0	4.4	14	3.0	27.7
9. Spotlight (+ Mero oil ¹) + Beloukha	1	16	6.3	15	5.0	25.7
10. Glypper (glyphosate) + Beloukha	2	16	6.8	12	5.7	20.2
11. Flurostar 200 (200 g L ⁻¹ fluroksypyr)	2	0	2.7	21.5	3.1	50.3
12. Saltex (22.5 % NaCl)	800	800	5.8	15.5	2.9	28.3
13. Saltex (22.5 % NaCl)	0	800	5.1	16	2.6	31.3
14. Swathing 5-7 days before seed harvest	0	0	7.8	6	-	-
15. No desiccation or swathing (control)	0	0	3	18	1.0	48.3
P-value			<.0001	<1	0.0001	<.0001
LSD (P ≤ 0.05)			1.5	4.8	1.0	7.3



Photo 3. White clover plot sprayed six days earlier with Harmonix FoliaPlus (T 3) (left). Untreated plot (T 15) to the right. Photo by Lars T. Havstad.

Conclusions

- All in all, swathing before harvest, using finger bar cutters, seems to be the most effective drying method under favourable weather conditions.
- While none of the tested chemicals were superior to diquat, the most promising alternatives were Harmonix FoliaPlus or Harmonix LeafActive in red clover and Harmonix FoliaPlus in white clover. Although usually less effective than these products, Beloukha also had an acceptable effect, especially when sprayed both early and late.
- The early spraying of Glypper followed by Beloukha after one week also resulted in acceptable desiccation, but this treatment cannot be recommended due to the risk for reduced germination capacity of the clover seed.
- No other product desiccated the crops sufficiently to be consider for use in clover seed production.